

Listing of Claims:

1. (currently amended) X-ray imaging device with computer means which is provided for visualizing blood flow in a coronary vascular tree of a patient such that the visualization is effected based on data which contain a first set of X-ray projection images of the vascular tree in various phases of a heart cycle, a first ECG of the patient recorded simultaneously with the first set, a second set of X-ray projection images recorded during or after administration of a contrast agent and a second ECG of the patient recorded simultaneously with the second set, which computer means comprise a program control which operates in accordance with the following method steps for determining a time-dependent concentration of the contrast agent within a three-dimensional structure of the vascular tree:

reconstruction of the three-dimensional structure of the vascular tree during the various phases of the heart cycle using the first set of X-ray projection images and splitting of the structure into a number of vascular segments;

determining the time-dependent concentration of the contrast agent within the reconstructed three-dimensional structure of the vascular tree by

aa) assignment of the second set of X-ray projection images to a respective phase of the heart cycle using the recorded second ECG;

bb) finding local image areas assigned to the individual vascular segments within the second set of X-ray projection images corresponding to spatial positions of the vascular segments in the respective phase of the heart cycle according to the three-dimensional structure of the vascular tree;

cc) determining the concentration of the contrast agent within the vascular segments by evaluating an X-ray absorption within the local image areas found in the method step bb); and

visualization of flow of the contrast agent through the three-dimensional structure of the vascular tree according to the time-dependent concentration of contrast agent, wherein the recording of the first and second set of X-ray projection images is effected at a plurality of projection angles.

2. (previously presented) X-ray imaging device as claimed in claim 1, wherein the second set of X-ray projection images is recorded during or after the administration of the contrast agent, while the vascular tree fills with the contrast agent and then the first set of X-ray projection images is recorded after the vascular tree is completely filled with the contrast agent.

3. (previously presented) X-ray imaging device as claimed in claim 1, further comprising means for generating the first and the second set of X-ray projection images of the coronary vascular tree of the patient under various projection directions and means for recording the ECG of the patient during the recording of the first and second sets of X-ray projection images.

4. (previously presented) X-ray imaging device as claimed in claim 2, wherein the computer means are arranged such that during or after the administration of the contrast agent the second set of X-ray projection images is recorded while the vascular tree fills with contrast agent, and subsequently the first set of X-ray projection images is recorded, after which the vascular tree completely fills with the contrast agent.

5. (currently amended) X-ray imaging device as claimed in claim 2, wherein the computer means are further arranged such that the recording of ~~at least one of the first and second set of X-ray projection images is effected at~~ the plurality of projection angles is by means of continuous rotation X-ray imaging.

6. (previously presented) X-ray imaging device as claimed in claim 1, wherein the computer means are arranged such that for reconstructing the three-dimensional structure of a computer-aided modeling of the vascular tree is effected while eliminating the other anatomical structures contained in the first set of X-ray projection images.

7. (currently amended) Computer program for an X-ray imaging device for visualization of the blood flow in a coronary vascular tree of a patient, wherein the computer program receives as input variables data which contain a first set of X-ray projection images of the vascular tree in various phases of a heart cycle, a first ECG of the patient recorded simultaneously with the first set, a second set of X-ray projection images recorded during or after the administration of a contrast agent and a second ECG of the patient recorded simultaneously with the second set, which computer program on the computer means of the X-ray imaging device implements a program control which operates in accordance with the following method steps for determining a time-dependent concentration of the contrast agent within a three-dimensional structure of the vascular tree:

reconstruction of the three-dimensional structure of the vascular tree during the various phases of the heart cycle using the first set of X-ray projection images and splitting of the structure into a number of vascular segments;

determining the time-dependent concentration of the contrast agent within the reconstructed three-dimensional structure of the vascular tree by

aa) assignment of the X-ray projection images of the second set to a respective phase of the heart cycle using the recorded second ECG;

bb) finding local image areas assigned to the individual vascular segments within the X-ray projection images of the second set that correspond to spatial positions of the vascular segments in the respective phase of the heart cycle according to the three-dimensional structure of the vascular tree;

cc) determining the concentration of the contrast agent within the vascular segments by evaluating an X-ray absorption within the local image areas found in the method step bb);

visualization of flow of the contrast agent through the three-dimensional structure of the vascular tree according to the time-dependent concentration of the contrast agent, wherein the recording of the first and second set of X-ray projection images is effected at a plurality of projection angles.

8. (currently amended) X-ray imaging method for visualizing blood flow in a coronary vascular tree of a patient having the following method steps:

a) recording a first set of X-ray projection images of the vascular tree during various phases of a heart cycle while simultaneously recording a first ECG of the patient, the recording of the first set of X-ray projection images being performed at a plurality of projection angles;

b) reconstruction of a three-dimensional structure of the vascular tree during the various phases of the heart cycle from the first set of X-ray projection images and splitting of the structure into a number of vascular segments;

c) recording of a second set of X-ray projection images of the vascular tree during or after administration of a contrast agent while a second ECG of the patient is being recorded, the recording of the second set of X-ray projection images being performed at a plurality of projection angles;

d) determining a time-dependent concentration of the contrast agent within a three-dimensional structure of the vascular tree as reconstructed in the method step b) by

aa) assignment of the X-ray projection images of the second set to a respective phase of the heart cycle using the recorded second ECG;

bb) finding local image areas assigned to the individual vascular segments within the X-ray projection images of the second set corresponding to spatial positions of the vascular segments in the respective phase of the heart cycle according to the three-dimensional structure of the vascular tree;

cc) determining the concentration of the contrast agent within the vascular segments by evaluating an X-ray absorption within the local image areas found in the method step bb);

e) visualization of flow of the contrast agent through the three-dimensional structure of the vascular tree according to a time-dependent concentration of the contrast agent determined in method step d).

9. (previously presented) X-ray imaging method as claimed in claim 8, wherein the second set of X-ray projection images is recorded during or after the administration of the contrast agent, while the vascular tree fills with the contrast agent and then the first set of X-ray projection images is recorded after the vascular tree is completely filled with the contrast agent.

10. (previously presented) X-ray imaging method as claimed in claim 8, wherein the recording of at least one of the first and second set of X-ray projection images is effected using continuous rotation X-ray imaging at a plurality of projection angles.

11. (cancelled)

12. (previously presented) X-ray imaging method as claimed in claim 8, wherein a computer-aided modeling of the vascular tree, with elimination of other anatomical structures contained in the first set of X-ray projection images, is effected to reconstruct the three-dimensional structure in method step b).